FINAL REPORT TO EPA REGION II
COMMUNITY OUTREACH TO AT RISK URBAN ANGLERS

EPA PROJECT MANAGER: Ann Richlenski

PRINCIPAL INVESTIGATOR: Kerry Kirk Pflugh, Research Scientist, Division of Science, Research and Technology, NJDEP

PROJECT ASSISTANT: Lynette Lurig, Research Assistant, Division of Science and Research, NJDEP

March, 1999

Final Report to EPA Region II:
Community Outreach to at Risk Urban Anglers

EXECUTIVE SUMMARY

Saltwater angling in New Jersey is a popular pass-time activity for many residents. Most New Jerseyans, when they think of salt water angling, envision the coastline from Keyport to Cape May. However, marine angling also takes place in the urban industrialized areas of northern New Jersey. This project focuses on a community-based public outreach program that was employed to inform urban anglers in the Newark Bay Complex of the state's fish consumption advisories for that region, and the health effects from eating contaminated fish and crabs. The Newark Bay Complex includes: the Newark Bay, tidal portions of the Hackensack and Passaic Rivers, the Arthur Kill and the Kill Van Kull. It is a highly industrialized urban area that encompasses more than 30 local governments and five counties with a large racially and culturally mixed population.

In 1982, research conducted by the New Jersey Department of Environmental Protection (NJDEP) showed elevated levels of dioxin and PCBs in certain fish and crabs in the Newark Bay Complex. Subsequently, the State of New Jersey adopted advisories to guide citizens on safe fish consumption practices.

The species under advisory in the Newark Bay Complex include: bluefish, blue crabs, American eels, white perch, striped bass, and white catfish. Advisories range from "do not eat", to "eat no more than once a week or once a month" depending on whether you are considered a high risk individual or general population. High risk individuals are defined as a women of child bearing age, pregnant women, nursing mothers and children up to 15 years of age. The primary health effects of concern are reproductive disturbances, developmental problems and an increased chance of developing cancer if contaminated species are consumed over a lifetime.

Since 1982, the State has issued fish consumption advisories primarily through the Fish and Game Digest, a publication distributed to licensed anglers at the point of purchase of a fishing license. However, anglers in the Complex are not required to have a fishing license because the waters are estuarine. Therefore, most anglers in this area do not receive advisory information unless they purchase a fishing license for fresh water fishing. As a result, a three-year community based public outreach effort was initiated in the Fall of 1993 to reach urban anglers with fish consumption advisory information. This outreach effort was unique for two reasons: 1) it attempted to identify citizen leaders in the affected communities to direct the information program, and 2) it employed local strategies that would take into account local concerns, customs and issues in developing the outreach effort.

The project goals included:

1. To inform urban anglers of the fish consumption advisories and the health risks associated with consumption of contaminated species;

2. To reduce exposure to potential health risks;

3. To establish mechanisms to disseminate future information quickly and effectively to urban anglers, local managers and health care providers;

4. To establish programs to encourage catch and release fishing, and

5. To establish a volunteer network of people to assist with information distribution to urban anglers.

Three site teams made up of city officials, fishing and environmental groups and concerned citizens were established to direct the outreach effort. Each site team differed in construct from site to site, but all sites consistently had a city official participating in the effort. At the end of the first year of the project a mid-term evaluation of the outreach effort was conducted to determine the effectiveness of the strategies in discouraging consumption of contaminated fish and crabs. The evaluation suggested that, for the most part, while the community may have been better informed generally, specifically, urban anglers still were either unfamiliar with fish consumption advisories or largely ignoring them.

This pointed to a need for a better understanding of the urban anglers in the Newark Bay Complex and their perception of the safety of fish to eat, knowledge of health effects from consumption of contaminated fish and crabs, and consumption patterns. An urban angler survey was developed to obtain this information. The purpose of the survey was to develop a more accurate profile of urban anglers in order to create an outreach strategy that addressed the barriers to compliance with fish consumption advisories that anglers identify. The survey sough to learn urban anglers': 1) knowledge of fish consumption advisories, 2) belief in the advisories, 3) perception of how safe fish are to eat, 4) sources for information about fish and fishing, 5) trusted channels to deliver this information, and 6) consumption patterns.

The study concluded that although 60 % of those surveyed said they had heard about the advisories, only 15% could correctly state them. We also learned that while a majority of anglers were Caucasian, the group in greatest need of health risk information was the Hispanic and Latino community who were largely unaware or unconcerned about fish consumption advisories. In addition, we learned that the most effective way to reach anglers with information about fish and fishing is through other anglers. For health risk information, the most reliable communication channel is the newspaper. Finally, the study indicated, that with the exception of crabs, most anglers in the estuary do not keep their catch, but consumption of crabs are at rates that pose a potential health threat to anglers.

As a result of this study several projects and research have been initiated to further explore and

understand the influence of culture and other sociodemographic factors on risk perception and the need to design targeted public outreach and education programs within communities using channels trusted and used within those communities.

COMMUNITY OUTREACH TO AT RISK URBAN ANGLERS

INTRODUCTION

In the state of New Jersey, with more than 130 miles of coastline, fishing is a multi-billion dollar commercial industry and a popular recreational sport. New Jersey is also home to most of the largest chemical producers in the country, most of which located near the most accessible transportation routes available at the time of their establishment in New Jersey- the bays and estuaries of the coast. With its successful industries creating many jobs and its convenient location, New Jersey also attracted a population of more than seven million people, most of them concentrated in the heavily industrialized northeast. (Shaw, 1994)

One of these waterways - the Newark Bay Complex has a long history of human interaction with the resources of the area for both aesthetic enjoyment and economic gain. The Newark Bay Complex can best be characterized as a highly industrialized urban area with a tidal river system that runs through more than 30 municipalities and five counties consisting of a large racially and culturally mixed population of more than three million. Ethnic groups include Portuguese, Puerto Rican, Korean, Polish, African American, Cuban, Italian, German, Irish and virtually all of the new immigrants now entering the United States. The Complex includes the Newark Bay, tidal portions of the Hackensack and Passaic Rivers, the Arthur Kill and the Kill Van Kull. The Newark Bay is the third largest port in the United States. The Complex has both active and closed landfills, power plants, oil refineries, waste water treatment plants, and commercial and residential properties lining its shores. Newark Bay has been extensively modified by dredging and filling since 1855 (National Marine Fisheries Service, 1994). The Complex's Passaic River, from the mouth of the Bay six miles up river has been designated an operable unit within a Superfund site due to dioxin contamination in the sediments, believed to be from the primary operable unit, which previously was a chemical manufacturing facility. The Complex is home to 265 species of birds, 56 species of fish representing 37 families of fish and megainvertebrates, and at least 54 species of benthic organisms representing seven phyla. The Complex also has a 7,000 acre estuary, the Hackensack Meadowlands, home of the New York Giants Stadium, and part of the Hackensack River which was designated one of America's 20 most threatened rivers by American Rivers in 1996. In 1998, the Passaic River was given this distinction.

Surface water classification for the Newark Bay and most of the Complex ranges from SE3 to SE2. SE3, saline/estuarine, classification restricts primary access to the water, such as swimming. It allows secondary contact which includes boating, maintenance and migration of fish and wildlife populations and migration of diadromous populations and any other reasonable use. SE2 is similar to SE3 except is allows for maintenance, migration and propagation of natural and established biota. Despite this, the Complex is heavily used by recreational anglers, with more than 20 marinas and at least 30 fishing locations throughout. However, commercial fishing has been closed for many years due to sediment contamination. Some of the contaminants of concern include dioxin, polychlorinated biphenels, polycyclic aromatic hydrocarbons, pesticides, mercury, chromium, and lead.

In 1977, EPA moved to ban the manufacture of PCBs, a probable carcinogen known to produce toxic effects in the laboratory at very low doses. Due, most likely, to a discharge of more than 500,000 pounds of PCBs from a facility on the Hudson River (Barclay, 1993) these substances along with dioxins and other related substances passed through the aquatic environment of the Newark Bay Complex where they continue to enter the food chain of crustaceans and finfish and build up in Bay sediments. (Shaw, 1994)

In 1982, research conducted by the NJDEP showed elevated levels of dioxins and PCBs in certain fish and crabs (Belton et al., 1982). Subsequently, advisories were adopted by the State to guide citizens on safe consumption practices. These contaminants have been classified by the U.S. Environmental Protection Agency as probable cancer-causing substances in humans. The species under advisory include, bluefish, blue crabs, American eels, white perch, striped bass, and white catfish. Advisories range from do not eat, to eat no more than once a week or once a month depending on whether you are considered a high risk individual or general population. A high risk individual is defined as a woman of child bearing age, pregnant women, nursing mothers and children up to 15 years of age. The primary health effects of concern are reproductive disturbances, developmental problems and an increased chance of developing cancer if consumed over a life time.

Subsequently, the fish consumption advisories were issued through the NJ Fish and Game Digest, a publication distributed to licensed anglers and bait and tackle shops throughout the state and signs were posted in the areas where the research was conducted. Since then, the state has notified the public of the bans and advisories each year through the NJ Fish and Game Digest. In addition, the state Department of Health has sent notices to local and county health departments throughout the state at the beginning of fishing season.

While this approach has been successful in reaching most recreational anglers in the state who purchase a fishing license, it has not been effective in reaching many urban recreational and subsistence anglers in the Newark Bay Complex. The primary problem with this notification is that a fishing license is not required in the Newark Bay Complex because it is an estuarine waterway.

Fishing organizations and environmental groups concerned that urban recreational anglers and subsistence anglers were not receiving vital health information about consumption of contaminated fish and crabs approached the NJDEP and asked that a special outreach effort be initiated in the Newark Bay Complex.

The New Jersey Department of Environmental Protection's Division of Science and Research responded by applying for and receiving a grant from EPA Region II to undertake a public outreach effort that would go beyond the public notification procedures the department was already conducting to develop a community based approach to communication. This final report is a summary of the activities that have taken place during the four year project.

PROBLEM STATEMENT AND GOALS

According to reports of local fishing and environmental groups, many urban anglers were not complying with state fish consumption advisories and were therefore exposing themselves to contaminants and thus negatively impacting their health. Several reasons were suggested for noncompliance:

1. fish consumption advisory information was not being disseminated to critical groups through the appropriate channels;
2. urban anglers were unaware of the advisories, or
3. urban anglers did not believe the advisories.

Project organizers needed to find the most effective means for communicating with urban anglers and to implement a strategy to educate anglers on ways to protect their health while continuing to enjoy recreational angling. Therefore, the goals of the project were:

1. to inform urban anglers of the fish consumption advisories and bans;
2. to explain the health risks associated with consumption of contaminated area fish and crustaceans;
3. to reduce exposure to contaminants from recreationally caught fish consumption;
4. to establish mechanisms to disseminate future information quickly and effectively to urban anglers, local environmental managers, and health care providers;
5. to establish programs to encourage catch and release, focusing on the benefits of recreational fishing, and
6. to establish an ongoing volunteer network of people to assist with information distribution to urban anglers annually.

The project then broke out into two elements. The first dealt with outreach and development of communication projects at the local level. The second element dealt with an angler survey and the need to develop a more accurate profile of the urban angler and his/her risk perceptions and beliefs in order to design a more effective outreach strategy in the future. This report will discuss the outreach program first then present the results of the urban angler survey.

COMMUNITY OUTREACH

The NJDEP began the community outreach effort in the fall of 1993. From the start, the department's approach to the outreach effort employed the basic tenants of risk communication (Pflugh et. al., 1992) — that citizens participate in decision-making and that they have access to all information on the subject in order to make informed choices. The major thrust of this effort was that the resulting communication strategy be a collaborative planning effort between state and local leaders. The project was unique for two reasons: it used a state/local partnership approach in designing the most effective communication strategies locally, and, it incorporated the perceptions, knowledge, and traditions of community leaders and residents in developing the strategy.

The project began with identification of community leaders and an assessment of their knowledge and concerns about fish consumption advisories. This initial contact took the form of a phone interview with selected citizens. These people included local and county health officers, conservation officers and marine police, environmental and fishing group members and civic leaders. The phone interview sought to learn respondents' knowledge of fish consumption advisories, knowledge of health effects associated with consumption of contaminated fish, concern about the issue, and how they share information with citizens in their community.

The results demonstrated that overall, while there was a vague awareness of fish consumption advisories, it was not an important health issue to area health officers and they were not routinely issuing advisory information to their constituents. In fact, some health officers were not convinced of the necessity of advisories. Sportsmen's groups indicated that they had a vague awareness of the advisories and while some were complying, most recreational anglers either did not know about the advisories or did not believe there was a problem with the fish and crabs. In addition, we learned that where advisories could be enforced, enforcement activities were, for the most part, not taking place. In short, the advisories in the Newark Bay Complex were virtually unknown or were being ignored. This indicated that the first step in conducting outreach to citizens was to work with these local leaders, share the information on fish advisories with them and encourage them to work with the state to determine the most effective way to disseminate information to the public.

Three site teams covering the Complex were identified. It was around these sites that community groups from the surrounding cities and municipalities were organized. Public health and environmental leaders acted as coordinators at the local level. A state representative was assigned as the liaison and technical support for the project. The grant provided each site with $3,000 to use in its outreach program. Each site then determined how it would use the money and provided state representatives access to people and other local resources to carry out projects. Throughout the development of these efforts the state provided status reports to the site teams and asked for additional direction and feedback as projects were designed.

Because the site teams wished to notify as broad a public as possible immediately, several traditional communication methods were used in the early months of the project. These included public meetings, brochures, flyers, presentations at professional meetings, displays at local events, signs, and networking through local fishing groups. At the end of the first year, site teams were asked to evaluate the effort and make suggestions for future outreach activities.

Through these efforts, citizens in the area had the opportunity to ask questions, talk to state scientists and get a better understanding of health affects associated with consumption of contaminated fish and crabs. Throughout that first summer, brochures and flyers were distributed to local leaders for their use in community outreach and for distribution at local events.

In September 1994, a midterm evaluation was conducted of the project. All site team members as well as fishing and environmental organizations were contacted for interviews. The evaluation indicated a need for more interactive programs focussing on children and women - the groups

most at risk from consumption of contaminated species. Site team partners felt educational tools for both the classroom and field that increased awareness of the estuary and provided river-related recreational opportunities, while explaining problems and how to get involved in solving them, should be the next step. Several projects were suggested: classroom lesson plans, an educational video for women's health clinics, public service announcements, an urban angler survey and urban fishing programs for city day campers and other urban youth.

As a result of this evaluation, year two focussed on projects that would identify and address the barriers to compliance with the fish consumption advisories. The major areas of focus were:

1) Public Service Announcements in English, Spanish and Portuguese for distribution on local cable channels in the Complex;
2) translation of existing information materials into languages as identified by site team members and the community;
3) a teacher workshop to develop a school curriculum on fish consumption advisories and bioaccumulation;
4) distribution of signs and brochures to community organizations as needed and requested, and
5) an urban angler survey at known fishing and crabbing locations throughout the complex to develop a more accurate profile of the Complex's urban anglers and to learn how they get their information about fish and fishing and who they trust to deliver this information.

Fishing for Answers Lesson Plans

In March 1995, a meeting with the Overpeck Park Site Team (Bergen County) was held. At the meeting it was suggested that the site team focus on the development of education materials about fish consumption advisories and bioaccumulation. These lesson plans could then be used by both health educators in presentations to school and youth groups and by classroom teachers.

The project began with the development of learning objectives and learning outcomes. The goal of these learning objectives and outcomes was to serve as a guide for the development of a series of lesson plans on health risks associated with consumption of contaminated species and techniques to reduce risk and prevent the pollution which caused fish to become contaminated.

Following the development of these guidelines by educators in the Newark Bay region, departmental staff conducted a literature search and review of existing curriculum materials to determine if there were education materials that met the needs of the community. Several lesson plans were compiled. In June 1995, 40 teachers, health educators, environmentalists and fishing organizations were invited to participate in a writer's workshop. In advance of the workshop, participants received the packet of lesson plans that had been compiled for this effort. Teachers were asked to review the material and determine what might be used, what might be adapted and what else was needed to meet the objectives of the Overpeck Park Site Team.

At the workshop, participants were divided into several groups. Each group focussed on a

different aspect of the fish consumption issue. For example, one group focussed on lessons dealing with risk reduction, another with proper preparation of fish, another with health risk and another bioaccumulation and pollution prevention. By the end of the day-long meeting, 30 outlines for new lesson plans had been suggested. A follow-up meeting edited these 30 down to 20. The lesson plans deal with natural and human history, land and water use, bioaccumulation and the effects of pollution on biota and ultimately human health. In September 1996, one of the partners, HEART, a predecessor of the Hackensack RiverKeeper, received a New York/ New Jersey Harbor Estuary grant to coordinate field testing of the lesson plans in area schools. Several in-classroom "tests" were conducted. Based on these experiences, modifications to *Fishing for Answers* were made. The lesson plans are currently receiving a final review and the document is being prepared for printing. It is expected that the document will be available to educators in the Newark area by the winter of 1998/99.

Public Service Announcement

The Elizabeth Site Team suggested the need for an educational video on the fish consumption advisories that could be used in the schools and distributed on public access cable. It became clear to the group that two types of videos were needed: a Public Service Announcement (PSA) alerting the public about fish consumption advisories and an educational video for women's health clinics describing in detail the health effects of consumption of contaminated fish and how to reduce exposure for this high risk group. The group focussed on the PSA first.

The 30-second PSA was designed to be released at the beginning of the fishing season to alert the public about fish advisories. It was taped in three languages - English, Spanish and Portuguese. The idea was that copies would be available for all site team members. Therefore, each community would have control over how and when it would be released to the public. The PSA was shot near Hudson County Park in July 1995. Unfortunately, due to a problem in editing, the PSAs were damaged and never aired on local cable stations.

However, an 11-minute education video targeted to women of child bearing age was shot in the Newark Bay area in the summer of 1996. The video discusses the advisories, identifies the species under advisory, talks about health effects from eating contaminated fish, and offers ways to properly prepare fish to reduce exposure to contaminants. It has been distributed to community groups and health departments in the region.

Urban Fishing for City Youth

During the summer of 1996, the Natural Resource Conservation Service Urban Program assigned a summer intern to assist site teams, the Division of Fish, Game and Wildlife and HEART in arranging and conducting several Urban Fishing programs with city youths. The goal of the program was to provide instruction on fishing and marine life in the estuary and promote an understanding of water quality and public responsibility toward aquatic resources. Four programs were conducted in four cities in the Complex. Approximately, 140 children and 40 adults participated in the program. Since then, more than nine communities within the Newark Bay Complex have participated in this program. Urban fishing programs have reached more than 300 children over the past two summers.

During the summer of 1998, the John Neu Family foundation provided funding to conduct Urban Fishing/Water Monitoring programs in four communities in the Complex. This program included four separate days of instruction including a fishing day at a local site. Approximately 100 students from four community groups participated in this program. The 1998 program was designed to determine the effectiveness of the education effort. In order to measure this, students were given a pre and post test on the first and last day of the program. The four sessions included an in-class day featuring mapping exercises, review of fish consumption advisories and an activity describing bioaccumulation, and three field days comprising of storm drain stenciling and a waterfront clean-up, emphasizing nonpoint source pollution, water monitoring of local waters and an ecocruise of the estuary and a day of fishing in local waters. The results of the pre-post testing indicate that concepts such as estuary, watershed and bioaccumulation were learned and understood by the students. In addition, the students appeared to learn the names of the fish under State fish consumption advisories.

URBAN ANGLER SURVEY

Rather than make assumptions about angler's knowledge and perceptions (Morgan and Lave, 1990) of health effects from eating contaminated fish and crabs, we believed information should be gathered from the target group itself. Therefore, an angler survey was developed. The objectives of the survey were to learn angler's:

1. demographics
2. perception of how safe the fish are to eat;
3. awareness of fish consumption advisories;
4. sources for learning about the advisories;
5. belief in health effects from consuming fish under advisory;
6. sources for information about fish and fishing, and
7. consumption patterns.

These factors were used to design an outreach program that incorporated the needs and concerns of urban anglers while addressing any misperception or lack of information they had regarding health and fish consumption advisories.

In developing this study, discussions with members of the local environmental and fishing community suggested the existence of an active subsistence fishery in the Newark Bay Complex, particularly among Hispanic populations. Subsistence used in this context is defined as a substantial reliance on recreationally caught fish as a major source for protein. Site visits to fishing and crabbing locations appeared to confirm this claim. One study of this region found that fish and shellfish are a traditional part of the diet of Hispanics in metropolitan New York City; 11% of those interviewed were consuming fish caught from local waters and only 27% of those interviewed were aware of fish consumption advisories (Zeidner, 1995). Another study of anglers in the New York-New Jersey estuary found that although 60% of anglers in the Arthur Kill reported hearing warnings about consuming fish caught in these waters, 70% of fishermen and 76% of crabbers said they ate their catch (May and Burger, 1996). This finding is of particular concern given research which concluded exposure before birth to relatively small

amounts of PCBs can result in deficits in a child's intellectual development (Jacobson and Jacobson, 1990, 1996; Gladen et.al., 1988).

The lack of knowledge of health effects and perception that fish are safe to eat could be one of the barriers to compliance with fish consumption advisories. In fact, in a previous study of the region it was found that fishermen in Jamaica Bay, New York believed they could tell if fish were unsafe by its appearance and odor (Burger, et. al., 1993). Additionally, a recent study of food safety issues comparing laypeople with scientists concluded that laypeople have more faith in their own sensory powers to determine whether or not a seafood has been adversely affected by a pollutant. They believe that pollutants will affect the flavor of fish and shellfish making it taste bad if it is affected by pollution (Johnson and Griffith, 1996). Anglers also may have difficulty believing health effect claims because the potential harm is too far in the future and too hypothetical to be taken seriously, suggesting that people may underestimate significant risk (Belton, 1985; Burger, et. al. 1993). A possible reason for this could be that fishing and eating of self-caught fish and crabs is a familiar and nonthreatening activity that anglers voluntarily engage in, thus diminishing their perception of risk or potential harm (Slovic, 1987).

We hypothesized then, that the typical urban angler in the Newark Bay Complex would be: male, retired, predominantly Hispanic, low income, using fish and crabs as a major source of protein, lacking knowledge of advisories, and lacking understanding of health impacts.

METHOD

Interviews were conducted with urban anglers at 26 fishing and crabbing sites around the Newark Bay Complex (Figure 1). Sites were selected through the assistance of local anglers who were familiar with local fishing activities. In-person interviews at fishing locations were selected because it would greatly increase the likelihood of reaching urban anglers who were fishing in the Complex and possibly consuming contaminated species. A pretest of the survey was conducted in early July, and interviews were conducted from July through October 1995 for 39 field days. A team of two interviewers were responsible for approximately six sites each field day. Not all sites were visited every field day, but all sites were visited on Sunday through Saturday to get a sample of anglers at each site on different days of the week. Because access to most sites required cars, interviewers drove from site to site or visited sites by boat at least twice each field day in order to interview anglers who might arrive at different times during the course of the day. Each site was visited by interviewers on every day of the week to determine if some days were more popular than on other days and also to ensure inclusion of the widest possible cross section of the angler population in the survey (Table 1). Interviews took approximately 15 to 20 minutes to complete. As near as possible, interview teams tried to enter the field during high tide, the time when anglers would most likely be fishing and crabbing.

Contingency tables were developed which compared responses of risk perception, information seeking behavior, and consumption to selected demographic data. Those comparisons which showed a significant association (i.e rejected the null hypothesis of no association with a probability of 5% or less using Chi Square test) were further analyzed to determine which demographic factors were most responsible for the significant association. In some instances,

categories were grouped together. For example: Japanese, Chinese and Korean were re-grouped into "Asian" and Cuban, Puerto Rican, Mexican and other Latinos were combined into "Hispanic."

Seven open-ended questions were included in the survey. In order to analyze responses, categories were created from responses to these questions. For the question dealing with safety of consumption, we asked how they made their judgement. Three categories emerged -- personal knowledge, environmental conditions and media/communications. For example, respondents who said the fish were safe to eat, who gave answers such as "I have been eating these fish all my life and nothing ever happened to me" or "I can tell which fish are bad by the way they look or smell" constituted the personal knowledge category. Another example is the question asking respondents to describe the fish consumption advisories. A correct answer included some statement that related specifically to the advisory for that body of water or species or the contaminant of concern. An example of a correct answer would be the "fish are unsafe to eat due to chemical contamination or due to dioxin or PCB poisoning. An incorrect answer would be "crabs have worms and the water has too much pollution."

RESULTS

Four hundred and twenty-one persons were approached; 300 interviews were completed. The response rate was 74%, with 4% declining because of language difficulties and 22% refusing to participate because they didn't want to be interviewed while they were fishing or crabbing. At the time of the interview the type of activity observed was, 147 people crabbing, 144 people fishing and nine both crabbing and fishing.

Angler Demographics

Ninety-one percent (n=272) of the anglers surveyed were male. The median age of anglers was 46. The largest ethnic group was Caucasian, 55% (n=165) followed by Hispanic, 20% (n=60), African American 17% (n=52), other (eg. Native American) 5% (n=15) and Asian 3% (n=8) . Eighty-three percent of the complex's urban anglers said they were most comfortable reading English. The most frequently reported education level was high school graduate, 45% (n=136). For household income, 18% (n=55) reported it was between $25,000 - $34,999 and 18% (n=53) said their household income was below $15,000 (Table 2). According to 1995 Federal guidelines, the average poverty threshold for a family of four is $15,569 (Federal Census Bureau, 1995). However, it should be noted that although 18% of households fall below this, we did not ask household size.

Type of Activity

Respondents' "fishing" activity was recorded based on interviewers' observations during the time of the interview. The categories recorded included: fishing, crabbing or both fishing and crabbing. Of the female respondents (n=28), 64% were crabbing, 29% were fishing and 7% were both fishing and crabbing. There was a statistically significant difference in the type of fishing activity by gender ($p = .06$). Women were more likely to crab than fish. Of the male

respondents, (n=136) 50% were fishing, (n=129), 47% were crabbing and (n=7) 3% were both fishing and crabbing. Respondents with household incomes of between $35,000 to $49,999 were more frequently observed fishing than crabbing while respondents with household incomes of between $10,000 and $14,999 were more frequently observed crabbing. (Table 3) Looking at the relationship of ethnicity compared to activity type, Hispanics were more frequently observed crabbing than fishing. Finally, we looked at age (independent of ethnicity) as it related to frequency of fishing. Those respondents who were 50 years old and older were more frequently observed fishing while respondents who were less than 50 were more frequently observed crabbing with the greatest percent crabbing between the ages of 40-49 (Table 3).

Perception of Safety of Consuming Fish

When respondents were asked whether they thought fish from local waters were safe to eat, 47% (n=140) said they were safe to eat, 34% (n=102) said they were not safe; 15% (n=45) don't know and 4% (n=13) responded with maybe (Graph 1). There was a significant difference in perception of fish safety among all ethnic groups (p=.01). A larger percentage of Caucasians believed fish were not safe to eat than did African Americans and Hispanics.

To get a better understanding of the respondents' risk perceptions, they were asked the basis for their judgement on the acceptability or non-acceptability of the fish for consumption. Fifty-nine percent of all respondents gave an environmental condition as their reason, such as "if the water was polluted there would be no fish," or " the fish are unsafe to eat because of runoff from industry." And 39% gave "personal knowledge" responses such as, "I've been eating them all my life and have never gotten sick" (Table 4).

Awareness of Fish Consumption Advisories

Respondents were asked whether they had heard of fish consumption advisories in the Newark Bay Complex. Although 60% (n=180) of anglers said they had heard of warnings against eating some fish in local waters (See Graph 2), when asked to describe the advisories, only 15% (n=46) of the respondents could correctly state the advisories (Graph 3). Fewer numbers of Hispanics and Asians ($p<.0001$) were aware of the advisories than other groups. In addition, among those respondents who stated they were aware of the advisories fewer Hispanics (p=.005) were able to identify the advisories correctly.

Sources for Fish Consumption Advisory Information

Anglers were asked where they had heard about the fish consumption advisories. Sixteen possible sources for information about fish consumption advisories were offered (Table 5). Respondents could give more than one answer. Of the options offered, the three sources most frequently cited for where they had heard about fish consumption advisories were -- newspapers 27% (n=80), signs 19% (n=58) and television 13% (n=40). Ethnicity significantly influenced the way groups responded (p=.001). The percent of Hispanics identifying newspapers as a source for fish consumption advisory information was less than for other groups.

Sources for Information about Fish and Fishing

Respondents' were offered 17 possible sources such as newspapers, bait and tackle shops, and friends from which to select for sources of information about fish and fishing . Respondents

could give more than one answer. The sources for information about fish and fishing most frequently used by anglers were -- other fishermen 64% (192), bait and tackle shops 38% (114), newspaper 30% (90), and cable television 19% (56) (Table 6). To get a better sense of what might influence information source selection, we looked at the relationship of age, income and language-most-comfortable reading with source of information. There was a statistically significant difference in respondents' use of newspapers as a source of information about fish and fishing by age group (p=0.0002); the greater the age of the angler, the more likely that newspapers were used as a source of information about fish and fishing. There was also a statistically significant difference in the respondents' use of other fishermen as a source of information about fish and fishing, by household income (p= 0.048); as income increased, the angler was more likely than not to rely on other fishermen as a source for information about fish and fishing. (Table 7). Additionally, for those with household incomes between $15,000 to$24,999, only 8% reported using cable T.V. as a source for information about fish and fishing and no one in this income range reported using radio (Graph 4).

In comparing language most comfortable reading to source for information about fish and fishing, again, other fishermen was most frequently selected as a source for information about fish and fishing for all respondents. Also, for those people who are comfortable reading both English and Spanish, only 11% relied on newspapers as a source for information about fish and fishing. Respondents most comfortable reading Spanish did not use magazines at all as an information source for this issue (Graph 5). Finally, we look at the influence of ethnicity on sources for information on fish and fishing. There was a significant difference among ethnic groups in the use of newspapers as a source of information about fish and fishing (p=.0001). Caucasians tend to cite newspapers as a source of information about fish and fishing more than African Americans, Hispanics and Asians. However, we could detect no significant difference among ethnic groups in their use of other fishermen, bait and tackle shops, cable television or magazines as a source of information about fish and fishing.

In addition to asking about sources for information about fish and fishing, we also asked respondents about what they use to obtain information about health, food safety and community news. Again, respondents were offered a number of choices and could select more than one answer. Interestingly, 73% of the respondents most frequently selected newspapers as a source for information about community news, 36% selected newspapers as a source for information about food safety and 33% selected newspapers as a source for information about health related issues, followed by television for all issues (Graph 6).

Belief in Health Effects

To gain knowledge of urban anglers belief in health effects from eating contaminated fish and crabs, three statements were read to respondents concerning the health impacts. The statements were developed based on toxicological interpretations of health risk. After reading the statements, interviewers asked anglers if they agreed or disagreed with the statements. Thirty-eight percent (n=115) agreed with the statement, "Eating locally caught fish/crabs over your lifetime may increase your risk of developing cancer," while 34% (n=102) disagreed and 28% (n=83) didn't know. Thirty-six percent (n=109) agreed with the statement, "Women eating these locally caught fish/crabs may increase the chance of harming the growth and development of

their unborn children," while 29% (n=88) disagreed and 35% (n=103) didn't know. And, 39% (n=116) agreed with the statement, "Young children eating these locally caught fish/crabs may increase the chance of harming their growth and development," while 31% (n=93) disagreed and 30% (n=91) didn't know. When the categories of "do not know" and "disagree" were collapsed for all three statements, an average of 62% of respondents either did not know or disagreed with the health risk advisories.

Consumption

To begin evaluating whether a subsistence fishery or supplemental fishery existed in the Newark Bay Complex, a series of questions were developed to learn the nature and extent of consumption of contaminated species by urban anglers. These questions included whether they ate what they caught and how often they ate what they caught. We felt this would help reveal the nature and extent of consumption of contaminated fish. 41% of the respondents (n=300) said they consume crabs. This compares to an average of 4% (n=300) of the respondents who reported eating each of the five other species under advisory. However, despite the higher consumption of crabs, we must be careful not to characterize crab consumption as an indicator of subsistence. In fact, only 2% of those respondents who reported eating crabs, eat them more than three times a week. It appears that responses to questions dealing with consumption reveal that the Newark Bay Complex is largely a catch and release fishery.

DISCUSSION

The objectives of this study were to develop an accurate profile of the Newark Bay Complex urban angler, to gain insight on perceptions on risk behavior in relation to the consumption of contaminated fish, and to determine who respondents trust to provide them with information about fish and fishing, food safety and health. These data will be used to develop an effective, targeted, outreach effort that incorporates the perceptions, concerns, and issues of urban anglers. Specifically, the study sought to learn how anglers in this area gain information about fish and fishing, who they trust to deliver this information and why they continue to consume contaminated fish and crabs despite health warnings. We had hypothesized that the typical urban angler in the Newark Bay Complex would be: male, retired, predominantly Hispanic, low income, using fish and crabs as a major source of protein, lacking knowledge of advisories, and lacking understanding of health impacts.

The study revealed that most urban anglers were either unfamiliar or unconcerned about fish consumption advisories, supporting our initial hypothesis. The largest group of urban anglers were non-retired male Caucasians. It appears that the lower the household income and the younger the anglers, the more likely they would be observed crabbing. There are several assumptions one could make about this observation. Crabbing requires less equipment and skill to perform, making it a more available activity. It also is easier to do, requiring little training and effort. Children of nearly any age who can drop a line in the water can crab and likely catch a crab. Because of the simplicity of the activity and the low expense, it makes it much more appealing for someone who may not be able to invest a great deal of time or money, yet still

wants to fish and walk away with a catch. Finally, crabs taste good and do not require a great deal of preparation to eat. All these factors make it a challenge to change angler's behavior and attitudes toward catching and eating crabs.

The study also explored respondents risk perception and why they continue to consume contaminated fish and crabs despite health warnings. We concluded that a majority of respondents either "disagreed" or "did not know" about health affects associated with consumption of these species. One possible factor that may influence respondents' perception of risk and belief in health effects is that there are no immediate ill effects associated with consumption of species contaminated with dioxins and PCBs. In fact, many of those who disagreed with the health effects statements told us that their reasons for ignoring health effects claims were because, "Nobody's died yet," or "I've been eating them all my life and haven't gotten sick." Also, the healthy appearance and good taste of the fish and crabs contributes to disbelief in the advisories as suggested by many anglers we interviewed; "If they were bad to eat, I'd know it. They'd taste bad." To further support their contention that fish are safe to eat, many anglers reported engaging in behavior such as soaking or purging the fish which they believe eliminates contaminants making them safe to eat. Several anglers also claimed that crabs, in particular, are filter feeders which gives them the ability to filter toxins from their system making them safe to eat. These observations reaffirm similar ones made by May and Burger (1996) for part of the same region.

This phenomenon of eating contaminated species despite health warnings to the contrary may be a manifestation of the voluntary vs involuntary response to risk (Slovic, 1987). Clearly, fishing is a voluntary activity and while anglers are not responsible for contaminants found in fish, it appears tainted fish are viewed as an unavoidable component of an otherwise enjoyable activity and therefore the risk seems less risky. Likewise, for those people supplementing their diet with these fish, if the choice is between providing a meal for their families now or possibly getting sick at some future time, the perception of risk is diminished. Additionally, cultural traditions and practices may also influence the perception of risk. These factors should all be explored in future studies.

In looking at the communication questions, we learned that agencies can not depend on the traditional means of communication - newspapers and television - as the primary or sole channel through which to communicate with the urban angler population about fish and fishing. Because anglers prefer to talk with other anglers about fish and fishing, more innovative strategies such as personal discussions with fishermen, and outreach through fishing clubs and bait and tackle shop owners will be more effective in reaching and educating this target audience. Despite this, however, we cannot overlook the influence of age, language and household income in selection of information sources for fish and fishing, and how this differs from selection of information sources for health, community issues and food safety. While anglers appear to rely on each other for information on fish and fishing, when asked where they turn for information about health, community news and food safety, the choice most frequently selected was newspapers. In addition, 27% indicated that newspapers were the source of information about fish consumption advisories. However, language must be considered, because while newspapers might be effective in reaching the English reading angler, only 16% of those anglers most comfortable

reading Spanish use newspapers as a source for information about fish and fishing and only 12% of those anglers who are comfortable reading both English and Spanish rely on newspapers as a source for information. This means that while messages on health related issues might be successfully communicated through newspapers, issues related to fishing will not. This poses a dilemma, because different audiences are using newspapers as an information source for different things. Because this health issue crosses categories, a strategy needs to be developed that takes into account a target audience with diverse information seeking behaviors, and trust in different communication channels to deliver health risk information. In other words, a strategy that includes personal contact with anglers as well as press releases to both English and Spanish language newspapers is likely to be more effective in reaching this audience.

We hypothesized that there would be a significant population subsisting on contaminated species. One possible interpretation of subsistence as used by many in the environmental community in the Newark Bay Complex is some kind of reliance on fish or crabs as a source for protein. The Newark Bay Complex is largely a catch and release fishery with the exception of crabs. Consumption of crabs, when they are available, appears to be high. Although use of this resource can not be described as "subsistence", it appears that crabs are being used as a supplemental source of protein for crabbers and their families. Thus, government must continue to be diligent about issuing advisories and targeting populations of people known to be large consumers of recreationally caught crabs because exposure to contaminants through crab consumption is high during the crabbing season.

CONCLUSION

Sandman (1989) talks about the need and importance of agencies to earn trust and credibility among citizens when seeking to communicate with them. In the best of circumstances, this can be a difficult challenge for agencies. But when you add language barriers, cultural traditions and low economic status to the equation, mixed with limited physical access to the citizens, the challenge can become daunting. This study sought to identify the risk perceptions and consumption patterns of urban anglers in the Newark Bay Complex toward recreationally caught fish and crabs. Understanding these factors will assist in the development of an outreach program that incorporates the needs, concerns and issues of anglers in this region. While outreach to people in this region in recent years has increased, these results suggest the need for additional study into the ways specific populations see and respond to risk information, in order to identify the specific barriers to knowledge of and belief in health effects from eating contaminated fish and crabs. Until the sociodemographic indicators for risk response and behavior can be clearly identified, changing the fish consumption habits among populations who either depend on or enjoy the opportunity to eat recreationally caught fish and crabs will continue to be a challenge.

ACKNOWLEDGMENTS

The authors would like to thank Elizabeth Yacovelli, Christina Pak, William Nyenhouse, Captain Bill Sheehan, Andrew Wilner, Ben Longstretch, Dave Zurheid and Kristin Rothrock for help in survey work and Bruce Ruppel, Judy Shaw, Drs. Branden Johnson, Alan Stern, Joanna Burger and Michael Gochfeld for technical assistance. This project was funded by U.S. Environmental Protection Agency, Region II.

REFERENCES

Barclay, B., 1993. Hudson River Angler Survey. Poughkeepsie, New York: Hudson River Sloop Clearwater, Inc.

Belton, T. J., Hazen, R., Ruppel, B., Lockwood, K. Mueller, R., Stevenson, E., Post, J.J., 1985. "A Study of Dioxin (2,3,7,8-Tetrachlorodibenzo-p-Dioxin) Contamination in Select Finfish, Crustaceans and Sediments in New Jersey Waterways." Trenton, New Jersey. NJ Department of Environmental Protection, Office of Science and Research.

Belton, T. J., Ruppel, B. E., and Lockwood, K., 1982. PCB's (Aroclor 1254) in Fish Tissues Throughout the State of New Jersey: A Comprehensive Survey. Trenton, New Jersey: NJ Department of Environmental Protection, Office of Cancer and Toxic Substance Research.

Belton, Thomas, Roundy, Robert and Weinstein, Neil, 1986. "Urban Fishermen, Managing the Risks of Toxic Exposure," Environment, Volume 28, Number 9, November.

Burger, Joanna, Staine, Kevin and Gochfeld, 1993. "Fishing in Contaminated Waters: Knowledge and Risk Perception of Hazards by Fishermen in New York City," Journal of Toxicology and Environmental Health, 39:95-105.

Christini, A., 1993. "Polychlorinated Biphenyls (PCBs), Chlordane and DDTs in Selected Fish and Shellfish from New Jersey Waters, 1988-1991, " Trenton, New Jersey: NJ Department of Environmental Protection, Division of Science and Research.

Economic Impact of the Port Industry on the NY/NJ Metropolitan Region, July 1995, prepared by the Economic Impact Division, Office of Economic and Policy Analysis Port Authority of New York and New Jersey.

Federal Census Bureau, Department of Commerce, 1995.

Gladen, B.C., Rogan, W.J., Hardy, P., Thullen, J., Tingelstad, J. and Tully, M., 1998. "Development after exposure to polychlorinated biphenyls and dichlorodiphenyl dichloroethene transplacentally and through human milk, The Journal of Pediatrics, December.

Hauge, P., 1993. Polychlorinated Biphenyls (PCBs), Chlordane and DDTs in Selected Fish and Shellfish from New Jersey Waters, 1988-1991. Trenton, New Jersey: NJ Department of Environmental Protection, Division of Science and Research.

Jacobson, J. L. and Jacobson, S. W., and Humphrey, HEB. 1990. "Effects of in Utero Exposure to Polychlorinated Biphenyls and Related Contaminants on Cognitive Functioning in Young Children," J. Pediatric 116:38-45.

Jacobson, Joseph L. and Jacobson, Sandra W.,1996. "Intellectual Impairment in Children Exposed to Polychlorinated Biphenyls in Utero," The New England Journal Medicine, Volume

335, Number 11, September 12, 1996.

Johnson, Jeffrey C. And Griffith, D.C., 1996, "Pollution, Food Safety and the Distribution of Knowledge, " Human Ecology, Vol. 24, No. 1.

May, Helen and Burger, Joanna, 1996. "Fishing in a Polluted Estuary: Fishing Behavior, Fish Consumption, and Potential Risk," Risk Analysis, Volume 16, Number 4.

Morgan, M. Granger and Lave, Lester, 1990. "Ethical Considerations in Risk Communication Practice and Research," Risk Analysis, Volume 10, pages 355-358.

New Jersey Department of Environmental Protection, 1994. "A Guide to Health Advisories for Eating Fish and Crabs in New Jersey." Trenton, New Jersey: NJ Department of Environmental Protection.

Pflugh, K. K., Shaw, J. A., and Johnson, B. B., 1992. "Establishing Dialogues with Communities: A Guide to Effective Communication Planning." Trenton, New Jersey: NJ Department of Environmental Protection, Division of Science and Research.

Shaw, J. A., 1994. "Risk Management Teams: State and Local Cooperation to Protect Public Health in Urban Coastal Communities," Atlanta, Georgia: ATSDR Conference.

Slovic, Paul. 1987. "Perception of Risk," Risk Analysis, Volume 236, pages 280-285.

Subsistence Management Regulations For the Harvest of Fish and Wildlife on Federal Public Lands in Alaska, 1997-1998. Federal Subsistence Board, U.S. Fish and Wildlife Service, Office of Subsistence Management, 10011 E. Tudor Road, Anchorage, Alaska, 99503.

Zeidner, Julie, 1995. "Survey Finds Hispanic Population Has Taste for Seafood," Nor'Easter, Spring/Summer.